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A Pictorial Field Key to the Armyworms and Cutworms ATTACKING VEGETABLES IN THE NORTH CENTRAL STATES

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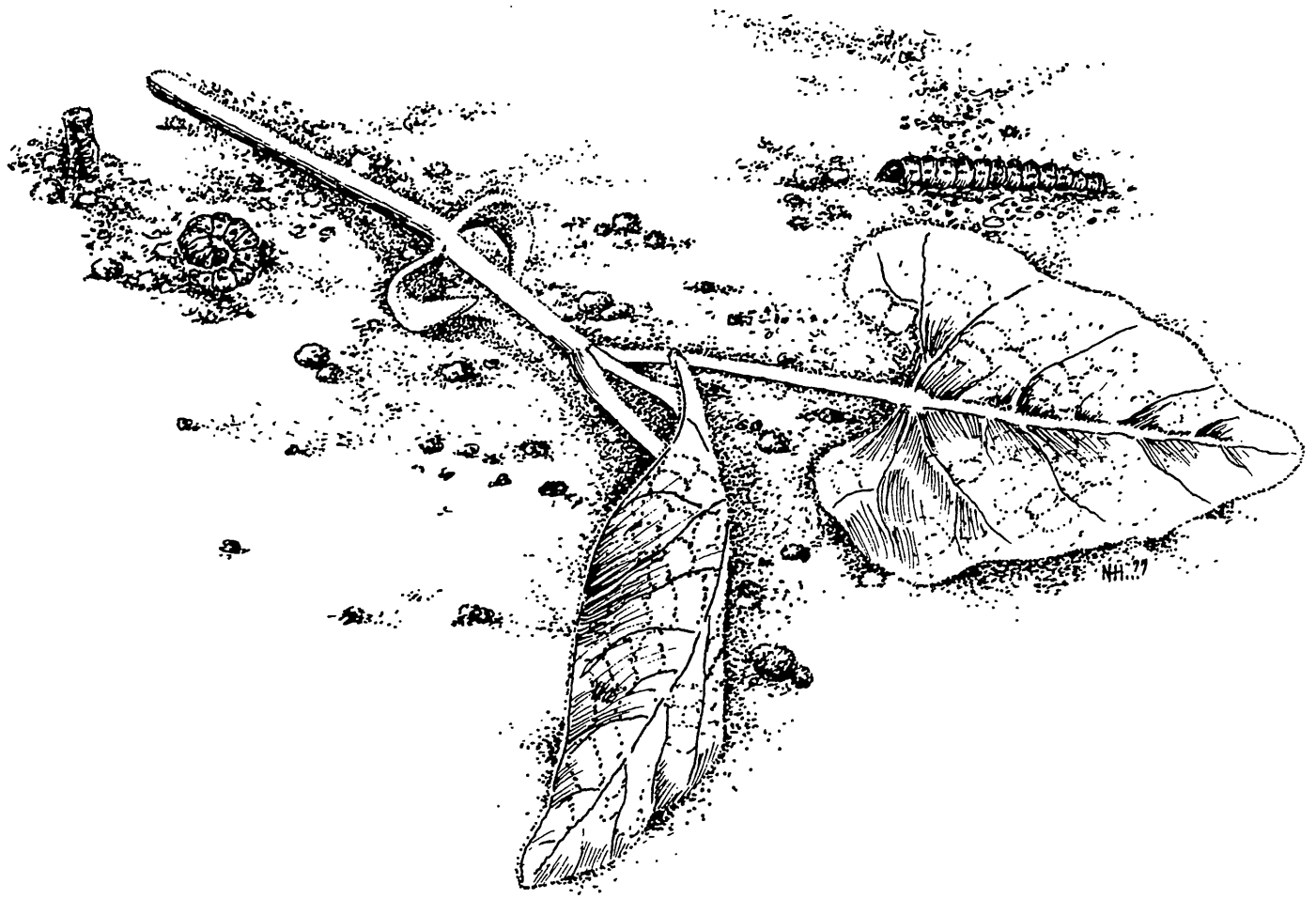

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A PICTORIAL FIELD KEY TO THE ARMYWORMS AND CUTWORMS ATTACKING VEGETABLES IN THE NORTH CENTRAL STATES[1]

Roy W. Rings[2]

Introduction

This publication contains two pictorial keys. The first key is for the identification of the different groups of soil pests, such as slugs, wireworms, white grubs, millipedes, and caterpillars (armyworms and cutworms). If you identify your unknown specimen as an armyworm or cutworm, then proceed to the second key (on page 8) to identify the caterpillar to species.

The key is designed for use in the north central United States but is probably applicable to most of the eastern states and lower central Canada. The key will not work for young larvae (1st to 3rd instars) which are less than 3/4 inch long. The key does not include some of the common cutworms in the southern and western United States. This key is neither infallible nor final. To make the key easier to use, many less common cutworms have been omitted. If you should try to identify the caterpillar of an omitted species, you will either be unable to identify it or end up in the wrong place.

Suggestions on how to scout for and preserve armyworms and cutworms are given on pages 5 and 32.

How to Use the Keys

To use the keys, begin at the first couplet and decide which alternative best fits the specimen to be identified. The number at the far right in each couplet indicates to what point you should proceed in the key. Each couplet choice is illustrated by one or more black and white illustrations of soil pests or caterpillars. When you reach an illustration which is most nearly like the unknown specimen, you should have made a determination of the species. Individuals within a species may vary somewhat in marking and color, depending upon food and various climatic factors, but usually retain certain basic species characters.

If there is any doubt about the identification, check the larval description on the page opposite the larval illustration for a more detailed and technical description. A 10x hand lens may be used to examine the head of the caterpillar for reticulation and submedial arcs. A stereomicroscope is required to see skin textures and mandibles.

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[1]Investigations supported in part by Environmental Protection Agency Grant No. EPA R802547 and U.S.D.A. Cooperative State Research Service Grant No. 316-15-99. A cooperative research program including University of Missouri, Illinois Natural History Survey, Iowa State University, Michigan State University, University of Nebraska, New York State Agricultural Experiment Station, Ohio Agricultural Research and Development Center, Purdue University, and the University of Wisconsin.

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A Pictorial Key to Groups of Soil Pests Attacking Vegetables

1. Pests without legs; 1/4 to 1 inch long; slime-covered; with two retractable "feelers" on head (Fig. 1) ..... Slugs

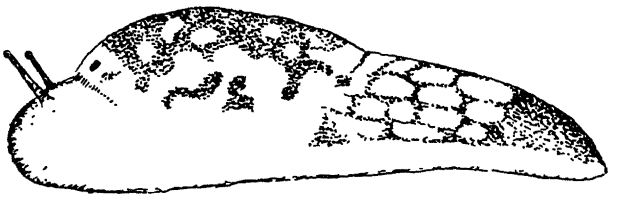

Figure 1.--A slug.

Pest with six or more legs 2

2. Pest with only six legs (Figs. 2 and 3) 3

Pest with more than six legs (including prolegs Figs. 4 and 5) 4

3. Pest with brownish head and whitish body; usually coiled in C-shape (Fig. 2) ..... White Grubs

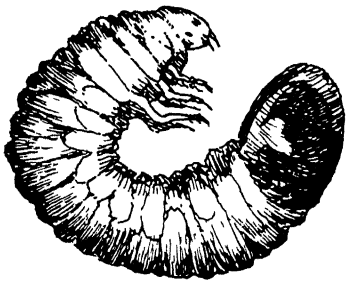

Figure 2.--A white grub.

Pest light or dark brown; hard-bodied; wire-like (Fig. 3) ..... Wireworms

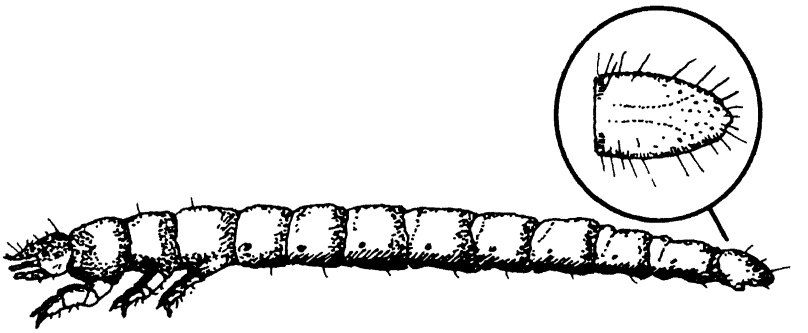

Figure 3.--A wireworm.

4. Pest with six pointed legs on front of body; ten blunt legs on middle and rear of body. Body not covered with large, darkly pigmented plates (Fig. 4) ..... Cutworms and Armyworms

Figure 4.-- A cutworm.

Pest with more than ten pairs of legs; legs all same shape; body cylindrical (Fig. 5) ..... Millipedes

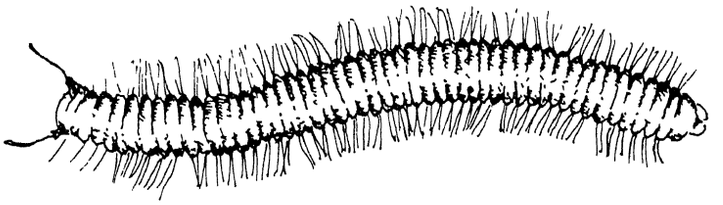

Figure 5.--A millipede.

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How to Scout for Armyworms and Cutworms

Cutworms, if present, will attack vegetable seedlings as soon as they emerge and attack sets as soon as they are planted in the field. The greatest damage occurs when vegetables are planted in fields following sod, meadow, or pasture. Most plants are severed completely just at, or slightly above, the ground level.

To scout for this type of damage, select at random five areas of the field for inspection. Usually each of the four corners as well as the center of the field are selected. Initiate scouting procedures immediately on the emergence of seedlings or the planting of sets. Examine fields as soon after daylight as feasible. Carefully, yet rapidly, examine the plants in 25-50 feet of row in each of these areas for cut-off or wilted plants. If either is found, use a trowel or knife to dig around the damaged plant for cutworms. Cutworms may be found at depths of 3 inches. Missing plants in a row do not necessarily indicate cutworm damage since this damage may be caused by a defective planter, rabbits, or other depredating vertebrates.

After cutworm damage has been verified, continue with a more thorough examination in four to five additional areas. Carefully examine and record the number of damaged plants and number of cutworm larvae per plant or per foot of row. If damage is present at low levels, re-examine the field for at least 2 more consecutive days. If damage is readily evident or continues, consult Extension Service recommendations or a qualified professional entomologist for control procedures.

The variegated cutworm usually does not become a problem in vegetable plantings until the latter part of June or the first of July. At this time potatoes and tomatoes are at least half-grown and can tolerate considerable damage without interfering with yield.

In scouting for infestations of variegated cutworms in potatoes, inspection should begin about June 15. Again, five representative areas of the field should be selected. One man can cover two rows at a time by walking slowly down the row and watching for foliage damage. This cutworm prefers to climb the plants and feed upon the tender foliage at the vine terminals. Leaves in those locations are devoured but the midvein is usually not eaten. When damaged plants are observed, lift prostrate vines and dig around the base of the plant. The full-grown larvae are almost always found buried in the soil at a depth of 1 or 2 inches. The earlier instars prefer to lay on the surface of the ground if there are prostrate vines to provide shade and moisture. Although economic thresholds have not been developed, studies show that more than 15 cutworms per foot of row are required before yield is lowered.

On tomatoes the variegated cutworm seems to prefer the fruit and will eat one large hole in the fruit and continue to feed on the internal tissues through this hole.

Some More Important Characters Used in Identification of Armyworms and Cutworms

Longitudinal stripes: The most prominent and recognizable features of armyworms and some cutworms are variously colored longitudinal stripes. The locations and names of these longitudinal stripes are shown in Figure 6.

Other markings: In addition to the longitudinal stripes, other prominent markings include the wedge-shaped markings on the spotted cutworm (Fig. 18), the row of pale spots down the center of the back of the variegated cutworm (Fig. 14), and the intricate markings on the back of the dingy cutworm (Fig. 22).

Head markings: The presence or absence of markings on the head help to separate and identify different cutworms. Two of the most important of the head markings are the submedial arcs and the extent of the reticulation (Fig. 7).

Tubercles: The hair-bearing (or setigerous) tubercles are small, wart-like bumps on the body which bear inconspicuous hairs or setae. These vary in size and intensity of pigmentation and are characteristic of each species (Fig. 33).

Cervical shield: This is an oval, sclerotized plate just behind the head on the top of the thorax. It sometimes has prominent markings as in Fig. 38.

Anal shield: This is a triangular, sclerotized plate at the tip of the rear end of the body on top. It also sometimes has prominent markings (Fig. 38).

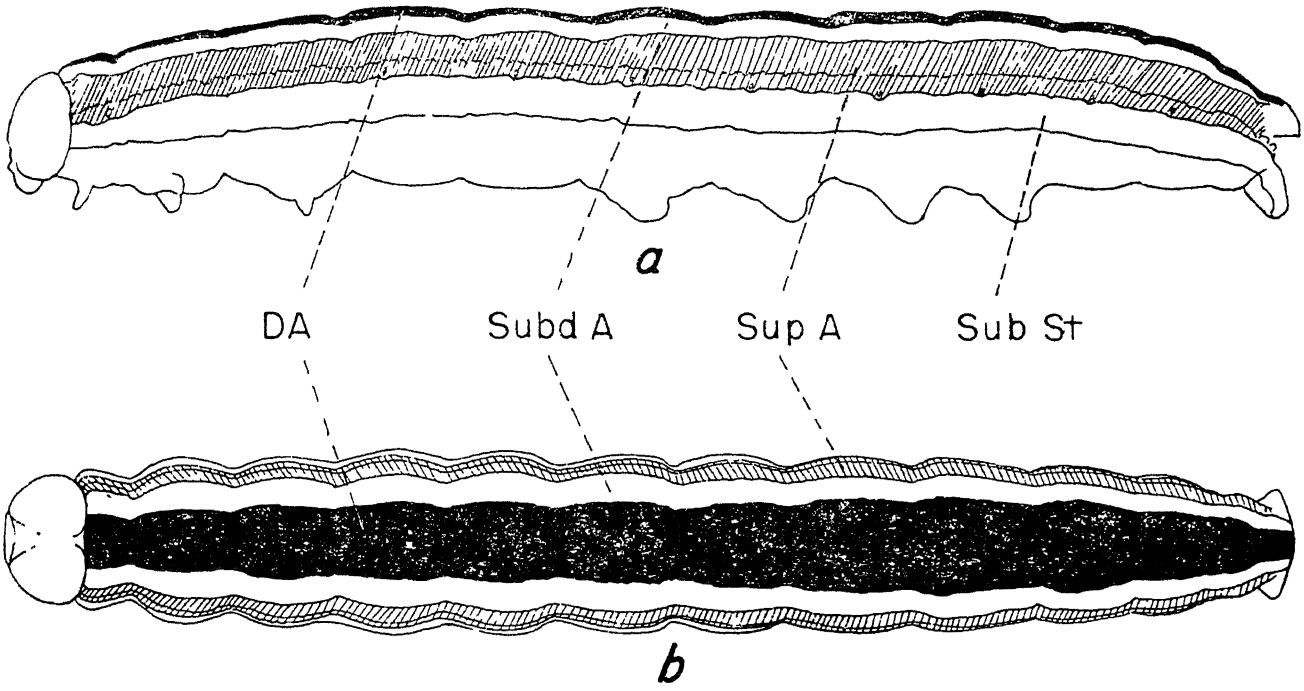

Figure 6.--Normally occurring stripes on cutworms and armyworms. a. Side view. b. Top view. Abbreviations: DA = dorsal area; Subd A = subdorsal area; Sup A = supraspiracular area; Sub St = subspiracular area.

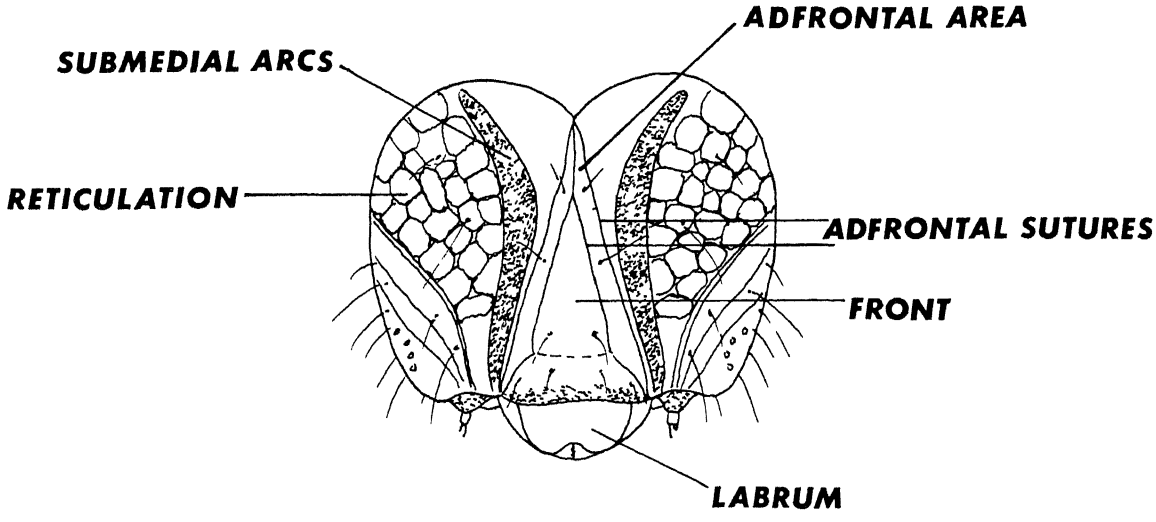

Figure 7.--Front view of head showing key structures and markings.

A Pictorial Key for Identifying Armyworms and Cutworms Attacking Vegetables in the North Central States

1. Caterpillar with conspicuous markings (Figs. 8 to 18) 2

   Caterpillar without markings or with faint or indistinct markings (Figs. 21 to 40) 5

2. Caterpillar with longitudinal stripes over most of body (Figs. 8 to 11) 3

   Caterpillar with prominent spots or wedge-shaped markings on back (Figs. 13 to 18) 4

3. Caterpillar with a double row of black, triangular markings on back bordered with a narrow white stripe; several indistinct stripes on sides (Figs. 8 and 9) .. Yellow-striped Armyworm

   Caterpillar yellowish-gray with a series of diamond-shaped markings on back; hairs on body coarse and prominent; smaller than other cutworms (3/4 inch) (Figs. 10 and 11) ..... Bristly Cutworm

4. Caterpillar dark mottled gray; a row of four to seven small, pale yellow markings down center of back; a conspicuous light stripe on side (Figs. 13 and 14) ..... Variegated Cutworm

   Caterpillar light gray; a pair of wedge-shaped markings on back of each abdominal segment, becoming larger toward the rear of the body (Figs. 17 and 18) ..... Spotted Cutworm

5. Caterpillar with inconspicuous markings (Figs. 21 to 35) 6

   Caterpillar with no markings; all whitish or grayish (Figs. 37 to 40) 10

6. Caterpillar with several indistinct dark stripes on back (Figs. 21 to 24) 7

   Caterpillar with only one broad (or narrow) inconspicuous stripe on back (Figs. 27 to 35) 8

7. Caterpillar brownish-tan; a faint, dark, V-shaped marking on back of each abdominal segment (Figs. 21 and 22) ..... Dingy Cutworm

   Caterpillar dull gray with numerous stripes; the dark gray stripe just above the spiracles prominent; setal tubercles heavily pigmented (Figs. 23 and 24) ..... Dark-sided Cutworm

8. Caterpillar with a broad, tan stripe down back; skin texture consisting of four, five, and six-sided granules (Figs. 26 to 28) ..... Clay-backed Cutworm

   Caterpillar with a narrow stripe down back; skin texture not as above 9

9. Caterpillar with a narrow, lighter stripe down middle of back; body color gray to black; skin granulose (Figs. 30 to 33) ..... Black Cutworm

   Caterpillar with a narrow, lighter stripe down middle of back; body color various shades of brown; paired dark blotches on abdominal segments (Figs. 34 and 35) ..... Mottled Gray Cutworm

10. Caterpillar head and neck shield reddish-brown; body all white; mandible with three inner teeth and four outer teeth; hair bearing tubercles minute (Figs. 36 to 38) ..... Glassy Cutworm

    Caterpillar head and neck shield brown; hair bearing tubercles prominent and darkly pigmented (Figs. 39 and 40) ..... White Cutworm

YELLOW-STRIPED ARMYWORM

Spodoptera ornithogalli (Guenée)

General color varies from pale gray to jet black. Dorsal coloration usually consists of dark strands of color on a pale background. Body about 35 mm. long and 6 mm. wide at middle. The black triangular markings, which are broadest in the middle, may be conspicuous on all segments but the thoracic and eighth abdominal segment. Usually there is a bright yellow stripe, just below the black triangular markings, which contains four narrower lines. There is usually a dark supraspiracular stripe which includes the spiracles at its lower edge. This broad stripe is longtidudinally marked with irregular pale lines. A broad, subspiracular stripe may be flecked with orange or pink. Head brown; overlaid with heavy, dark, obscure reticulation. Skin smooth. Spiracles brownish. Setigerous tubercles small.

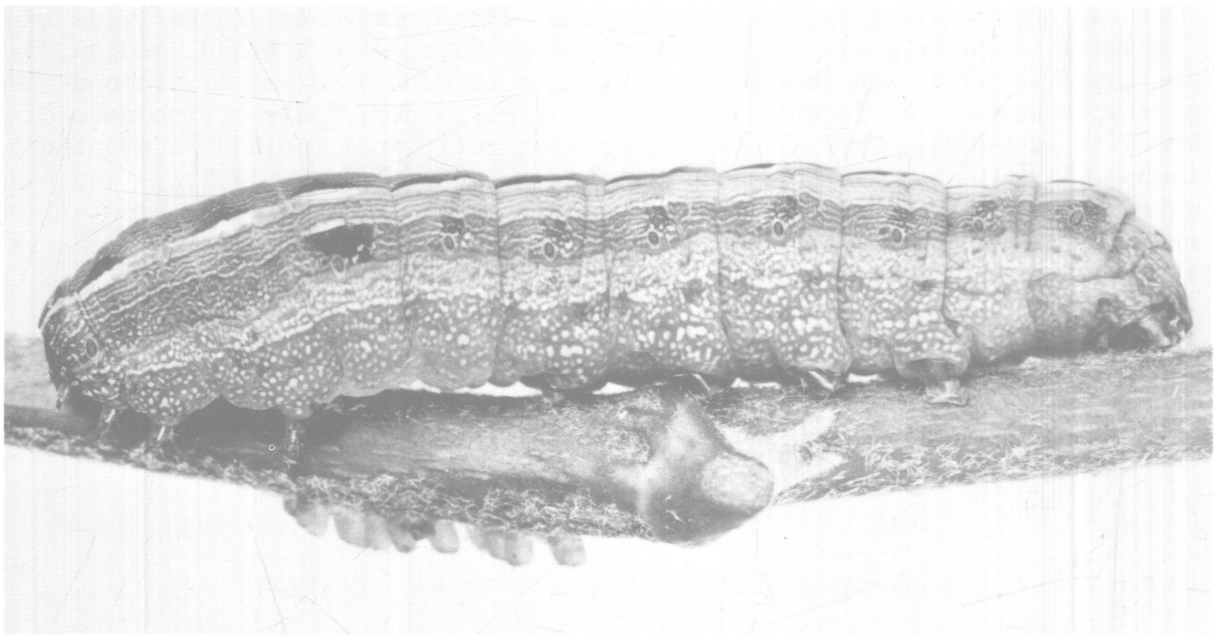

Figure 8.--Lateral view of yellow-striped armyworm (3.8X).

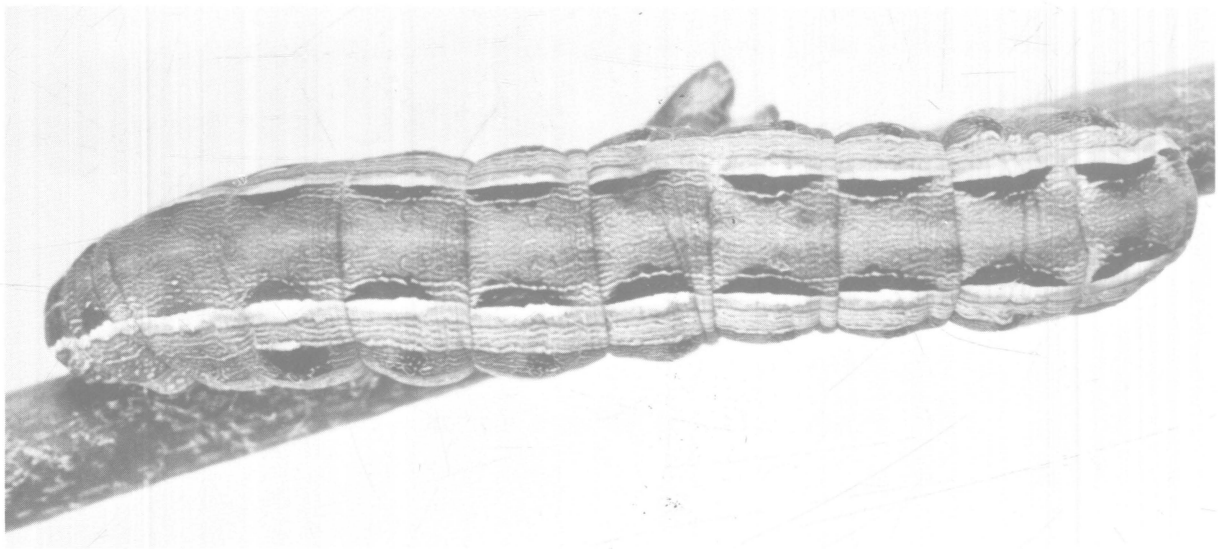

Figure 9.--Dorsal view of yellow-striped armyworm (3.8X).

BRISTLY CUTWORM

Lacinipolia renigera (Stephens)

General color pale gray. Body only about 23 mm. long and 4.5 mm. wide at middle, tapering slightly posteriorly. Dorsal area pale, with a broad, median, dark stripe, constricted at the juncture of segments to form a series of diamond-shaped or egg-shaped marks. An inconspicuous, subdorsal, narrow, pale stripe more or less flecked with brownish. Upper half of supraspiracular area includes a prominent, continuous black stripe; lower half blackish, much flecked with white. Setae heavy and unbranched. Head grayish-brown; coarsely granulose; the black submedial arcs and reticulation almost obscure the ground color dorsally. Skin bearing coarse, isolated, elevated granules. Spiracles dark brown.

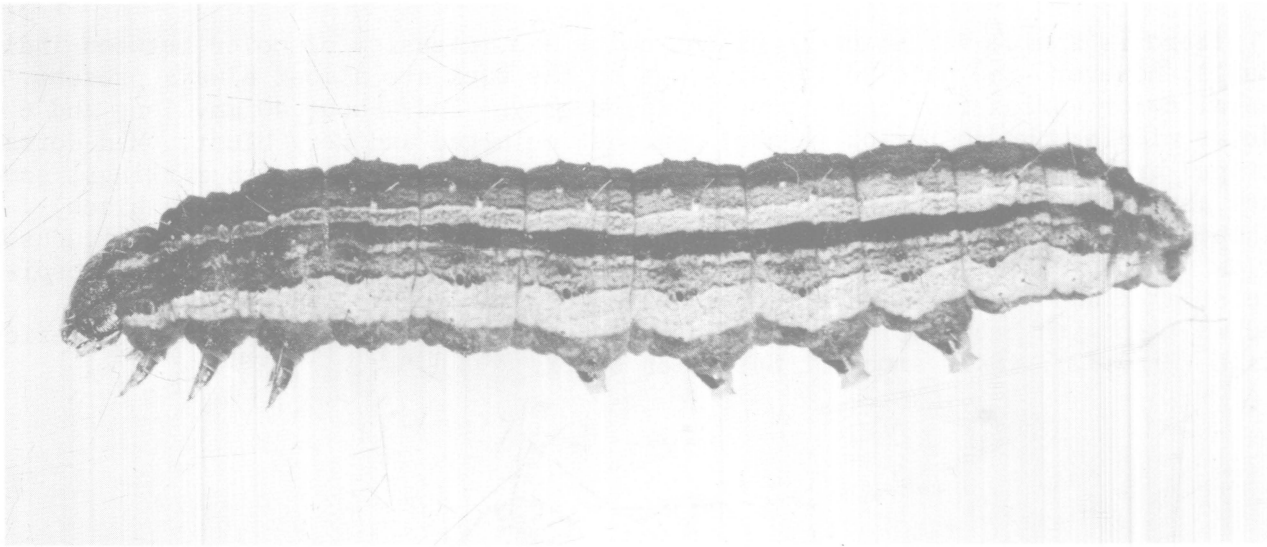

Figure 10.--Lateral view of bristly cutworm (6X).

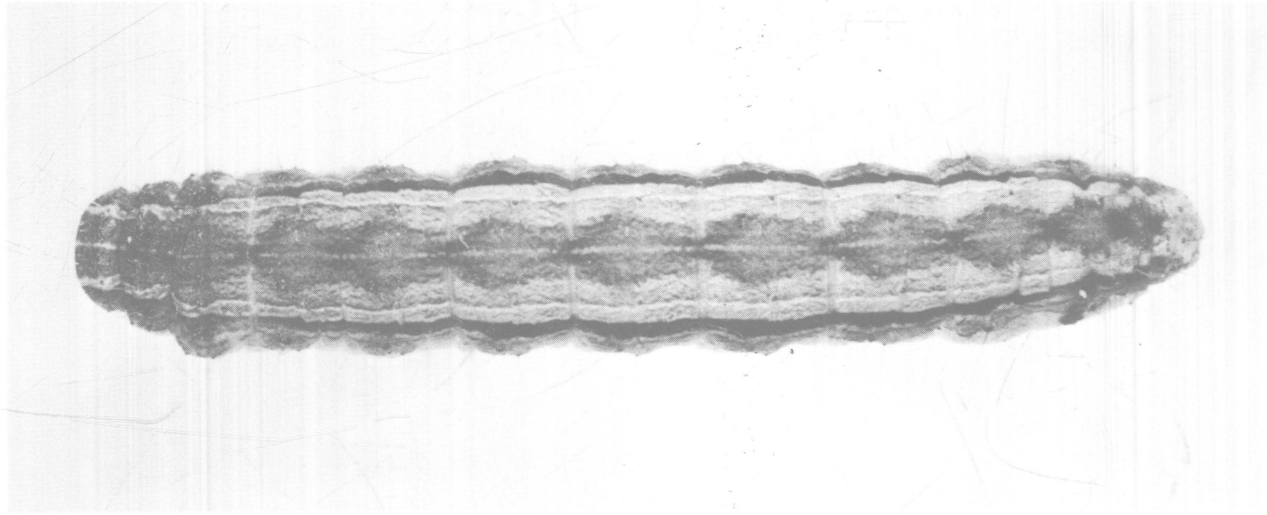

Figure 11.--Dorsal view of bristly cutworm (6X).

VARIEGATED CUTWORM

Peridroma saucia (Hübner)

There is a wide variation in ground color and intensity of color between individuals; however, the pale yellow markings on the back are almost always present. General color varies from dark brown to light gray. Body about 40 mm. long and 6 mm. wide at middle; the posterior segment somewhat enlarged and very blunt. Mid-dorsal "stripe" broken, leaving four to seven distinct whitish or yellowish markings; sometimes absent in earlier instars. In the final instar there is usually a black W-shaped mark on the dorsum of abdominal segment eight, followed by a conspicuous yellow or orange area. Usually a narrow, orange-brown spiracular stripe. Subspiracular area and ventral area paler with irregular orange and yellow markings. Head whitish with broad, black submedial arcs and a varying amount of darker reticulation (Fig. 12). Skin smooth. Spiracles black.

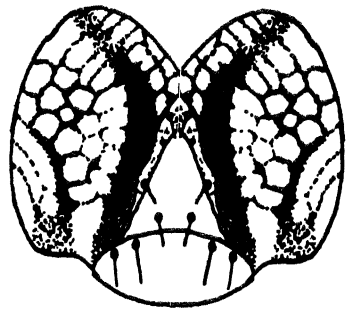

Figure 12.--Front view of head of variegated cutworm showing submedial arcs (13X).

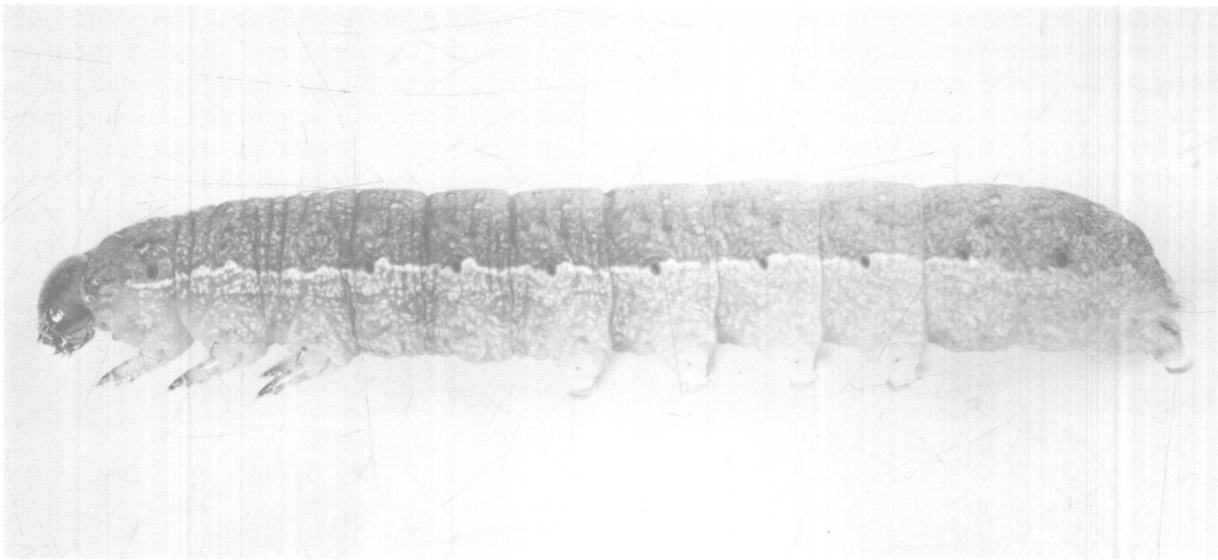

Figure 13.--Lateral view of variegated cutworm (3X).

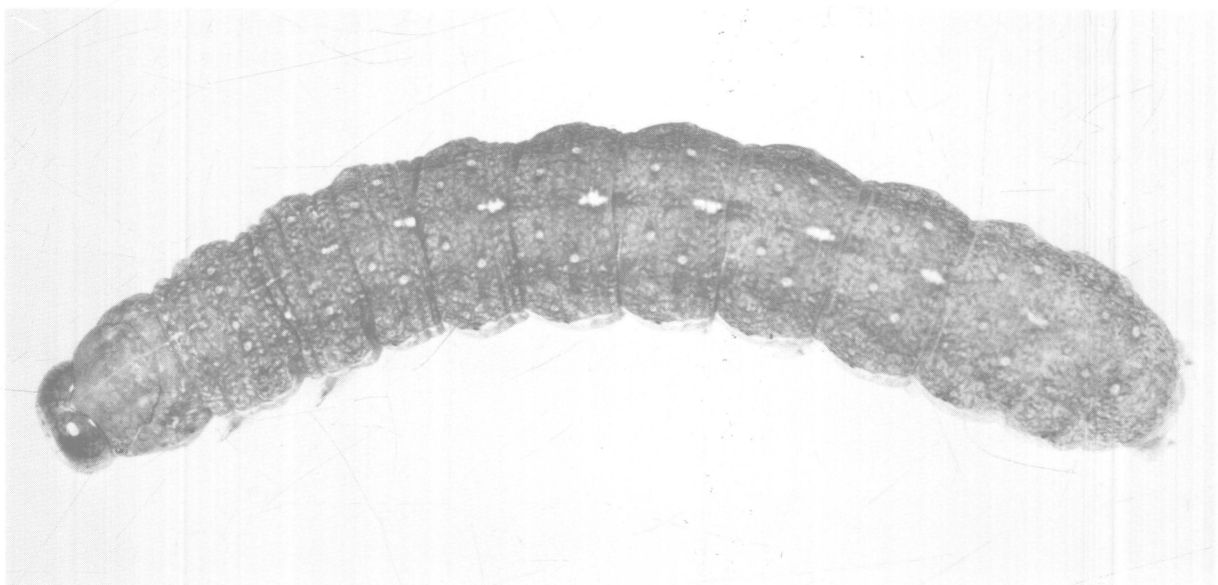

Figure 14.--Dorsal view of variegated cutworm (3X).

SPOTTED CUTWORM

Amathes c-nigrum (L)

General color varies from brown to grayish. Body about 35 mm. long and 4.5 to 6.5 mm. wide; abdominal segments of about equal width throughout. A segmental series of elongated, black markings in the subdorsal area, forming large wedge-shaped markings on the seventh and eighth abdominal segments. Dorsal, subdorsal, and supraspiracular areas of the same color, sometimes tinged with brown or orange. A broad, pale subspiracular stripe tinged with pinkish or orange. Head pale brown with black submedial arcs and dark brown reticulation (Fig. 15). Mandible with four prominent outer teeth and one inner tooth (Fig. 16). Skin smooth. Spiracles whitish or yellowish.

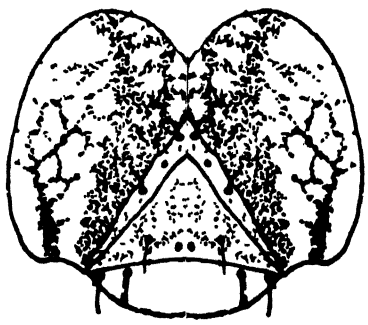

Fig. 15.--Front view of head of spotted cutworm (13X).

Figure 16.--Left mandible of spotted cutworm (62X).

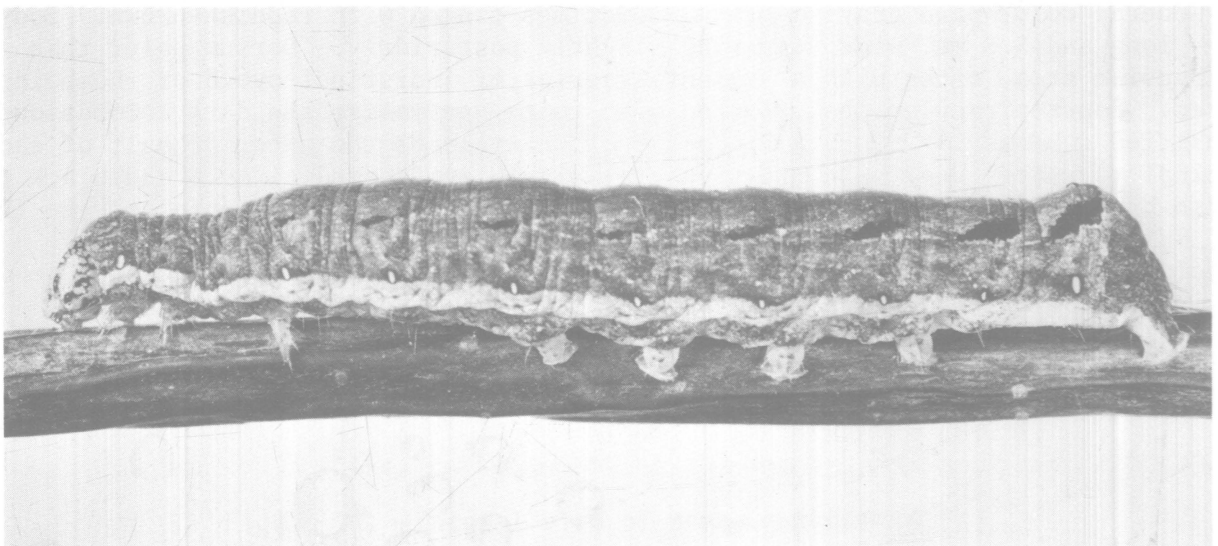

Figure 17.--Lateral view of spotted cutworm (3.5X).

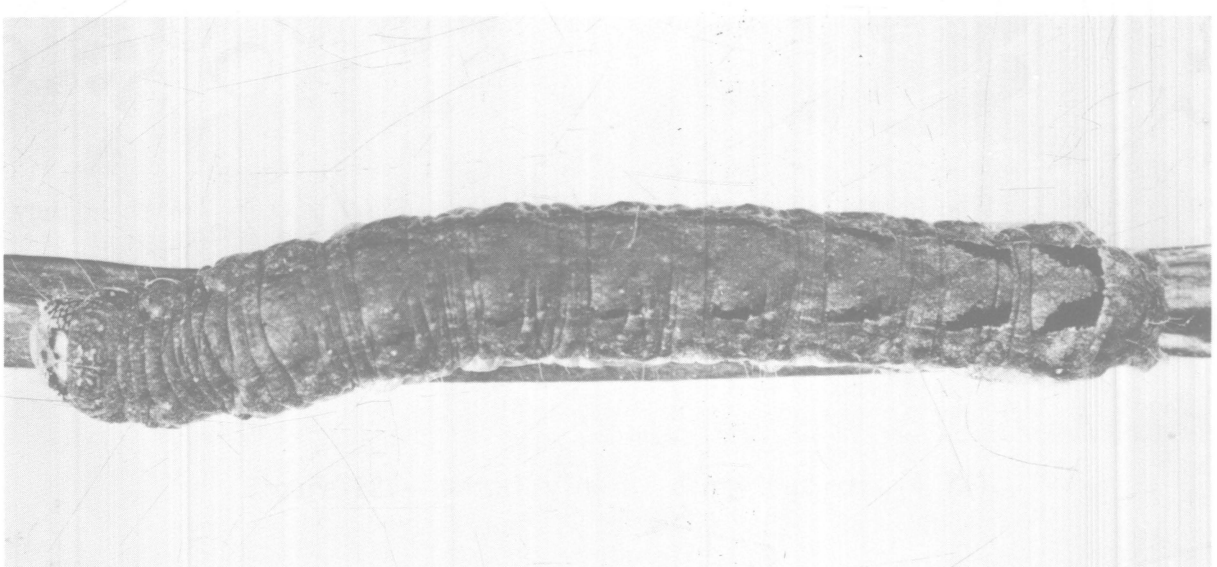

Figure 18.--Dorsal view of spotted cutworm (3.5X).

DINGY CUTWORM

Feltia ducens Walker (= *subgothica* Haworth)

General color pale grayish-brown, sometimes tinged with reddish-brown. Body 32 mm. long and 5.5 mm. wide; tapering slightly posteriorly. Dorsum paler than supraspiracular area, often with a segmental series of indistinct ovoid or rhomboid figures. Supraspiracular area flecked with white ventrally, the dark coloration intensified subdorsally to form a black spot on at least the anterior half of each abdominal segment. Head pale brownish-gray with black submedial arcs and black or reddish-brown reticulation. Mandible with five distinct teeth on outer margin (Fig. 19). Skin bearing coarse, distinctly isolated, subconical granules (Fig. 20). Spiracles black. Setigerous tubercles large and black. This species cannot be distinguished from *Feltia herilis* (Grote) in the larval stage.

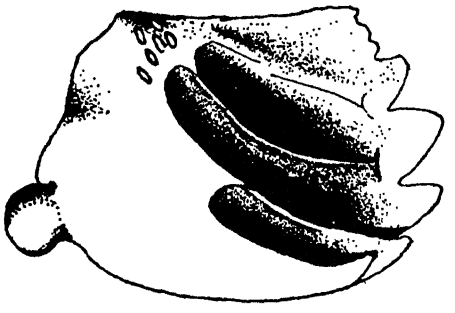

Figure 19.--Left mandible of the dingy cutworm (62X).

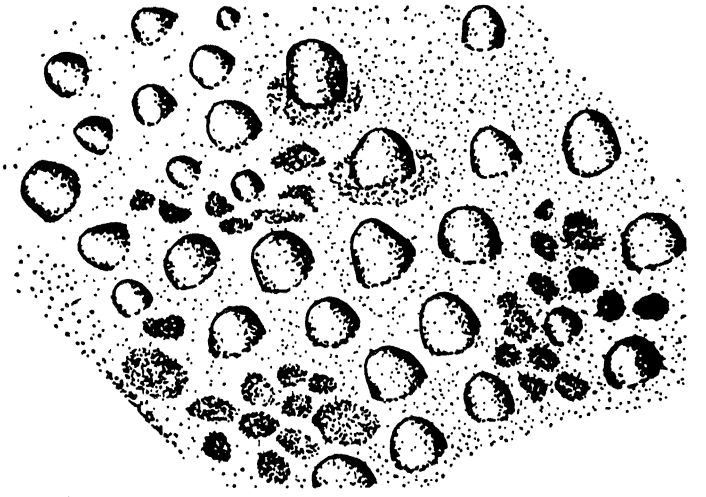

Figure 20.--Skin texture of the dingy cutworm (5,000X).

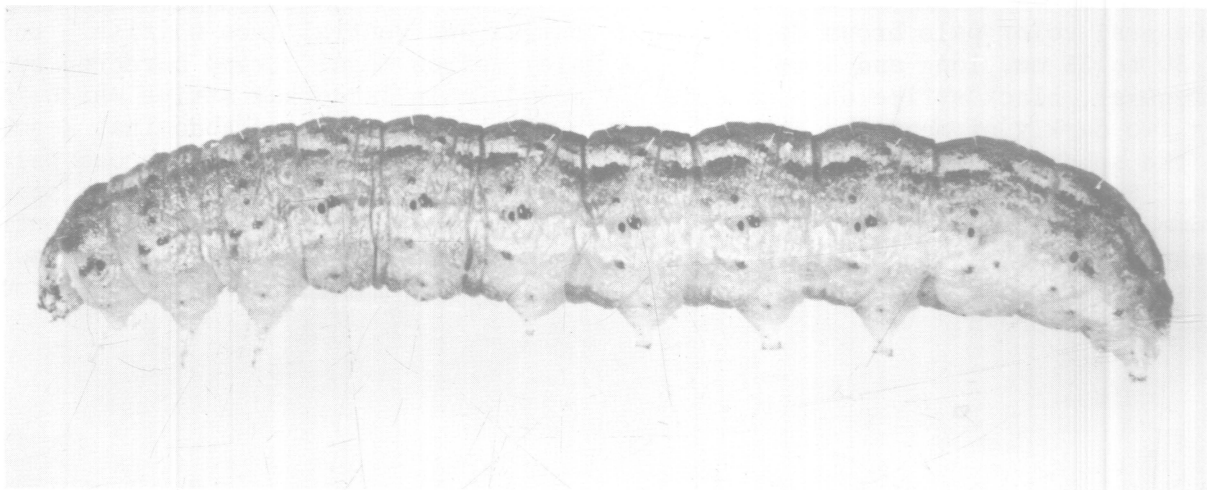

Figure 21.--Lateral view of dingy cutworm (4.7X).

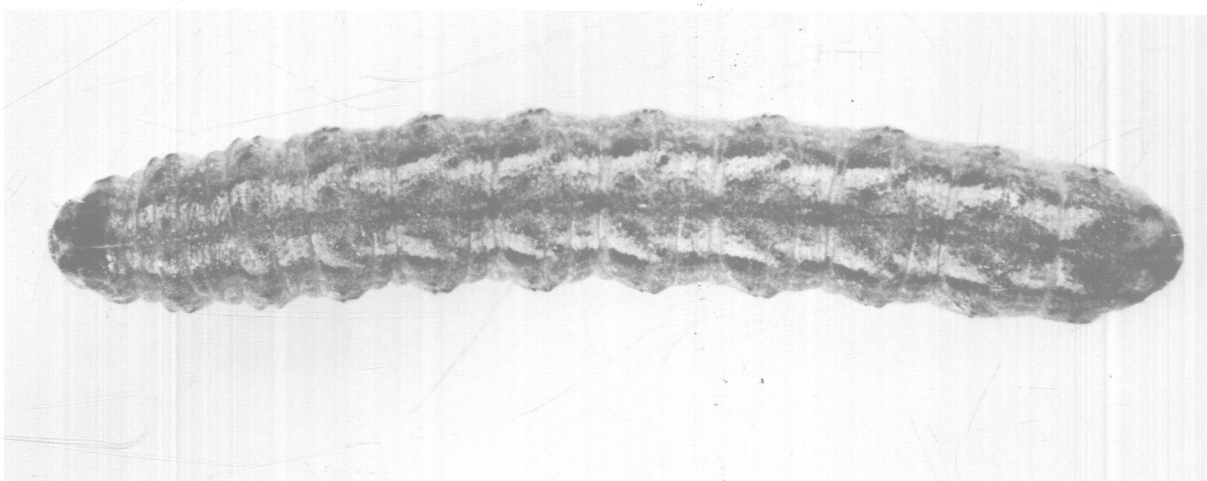

Figure 22.--Dorsal view of dingy cutworm (4.7X).

DARK-SIDED CUTWORM

Euxoa messoria (Harris)

General color pale brown dorsally; subventral and ventral area whitish. Body about 30 to 35 mm. long and 5 mm. wide. A pale, narrow mesal stripe bordered by an irregular, black stripe on each side. A broad, pale subdorsal stripe which includes two darkly pigmented tubercles on each of the thoracic and abdominal segments; below the subdorsal is a narrow, dark brown stripe followed by another broad pale stripe. Below this is the dark brown supraspiracular stripe which gives the species its common name of "dark-sided" cutworm. The spiracular, subspiracular, subventral, and ventral areas are all whitish. Head pale brown with clusters of darker brown, round spots near the cervical shield, also above and behind the ocelli. Skin smooth. Spiracles dark brown.

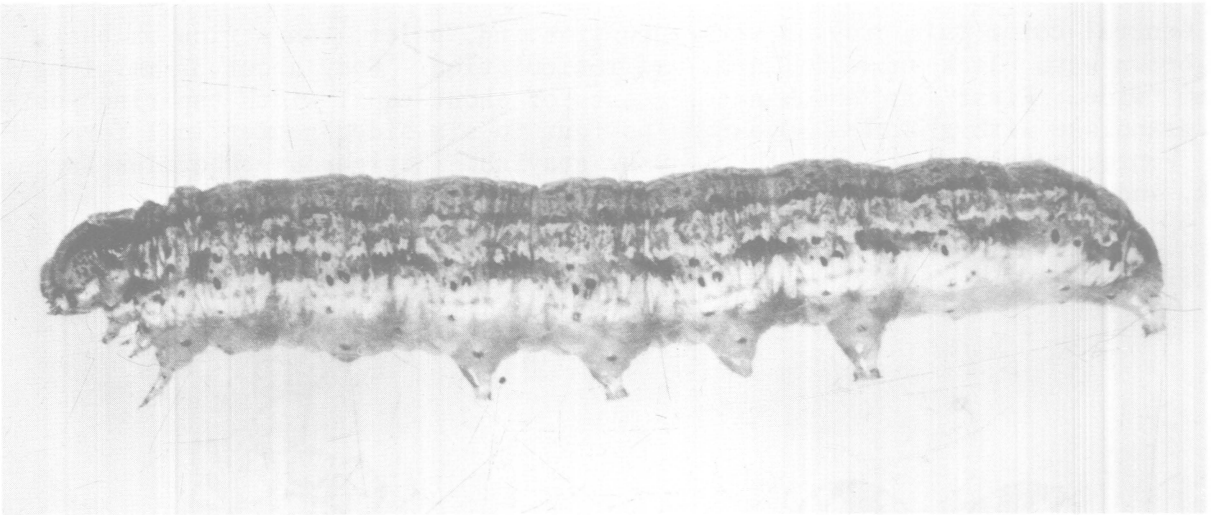

Figure 23.--Lateral view of dark-sided cutworm (5X).

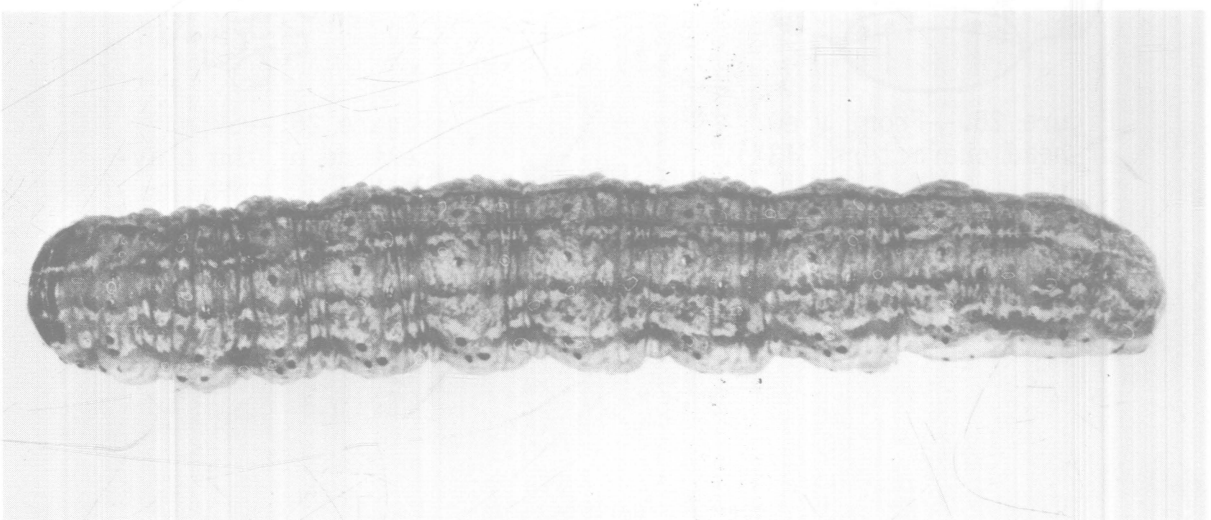

Figure 24.--Dorsal view of dark-sided cutworm (5X).

CLAY-BACKED CUTWORM

Agrotis gladiaria (Morrison)

General color pale grayish with a contrasting, paler, tan stripe on back. Head gray-brown with black submedial arcs and reticulation. Body about 37 mm. long and 5.5 mm. wide. First four abdominal segments of about equal width tapering posteriorly. Skin granulose with granules appearing as four to six-sided geometrical forms (Fig. 26). Venter varying from grayish to dusky grayish. Setigerous tubercles large, black, and nearly flat. Spiracles entirely black.

Figure 25.--Front view of head characters (13X).

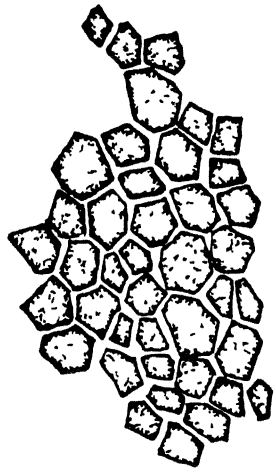

Figure 26.--Skin texture of the clay-backed cutworm.

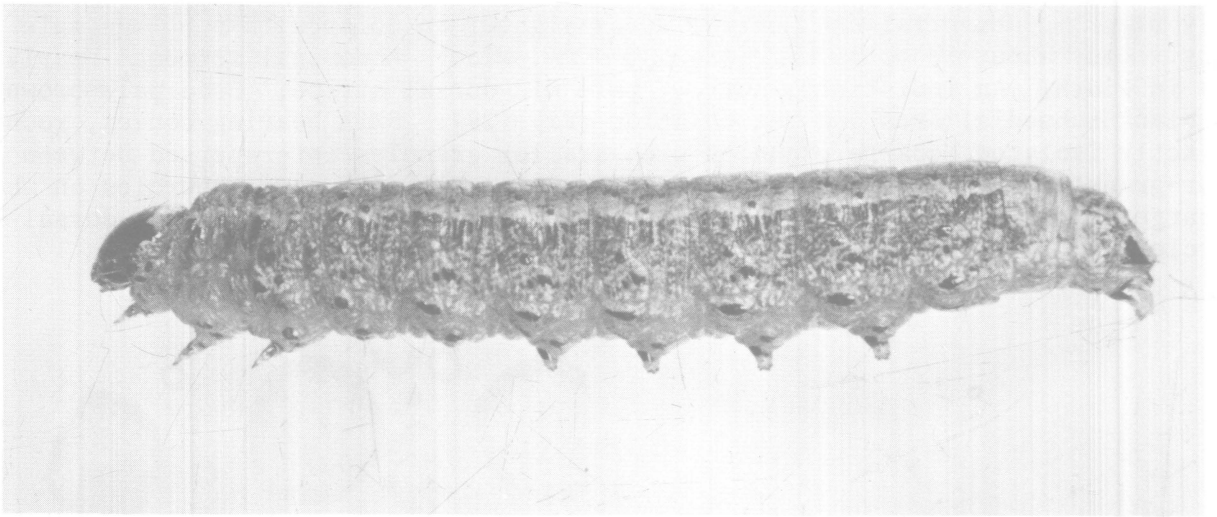

Figure 27.--Lateral view of the clay-backed cutworm (4.3X).

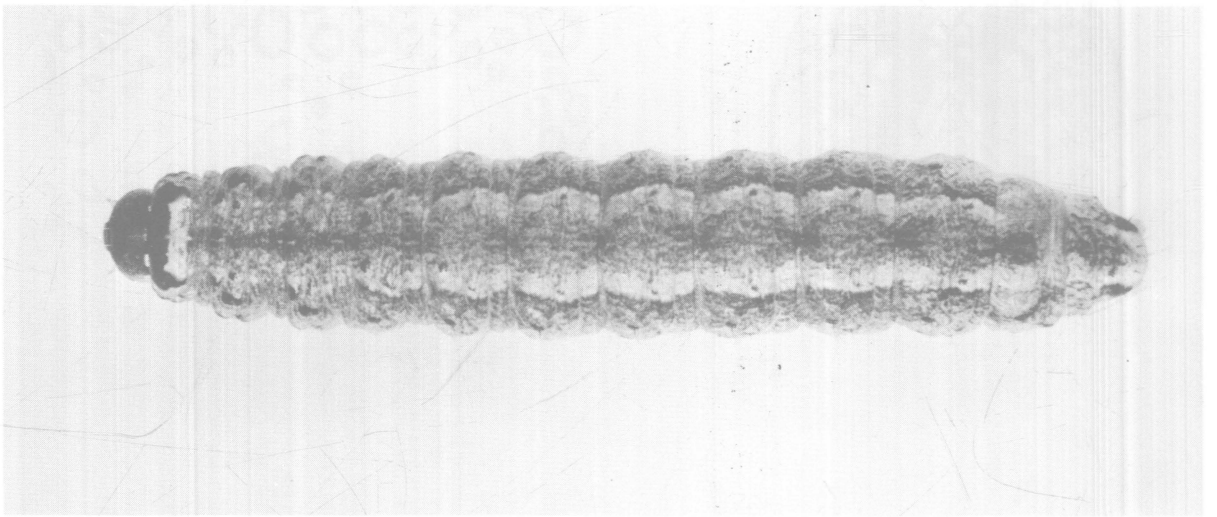

Figure 28.--Dorsal view of the clay-backed cutworm (4.3X).

BLACK CUTWORM

Agrotis ipsilon (Hufnagel)

General color above the spiracles nearly uniform, varying from light gray to nearly black. Subventral and ventral areas lighter in color with numerous pale flecks. Body about 30 to 45 mm. long and 7 mm. wide. Abdominal segments nearly equal in width. An indistinct, narrow, pale mid-dorsal stripe. Head pale brownish with black submedial arcs and reticulation (Fig. 29). Skin bearing convex, rounded, distinctly isolated, coarse granules with smaller granules interspersed between the larger granules (Figs. 30 and 33). Spiracles black. Setigerous tubercles on abdomen large; anterior dorsal tubercle only one-third as large as posterior dorsal tubercle.

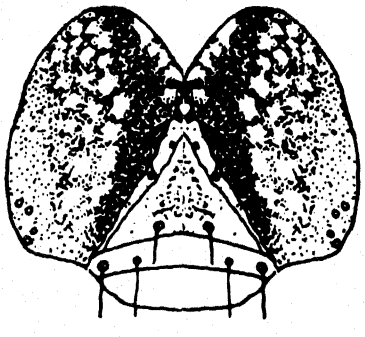

Figure 29.--Front view of head characters (13X).

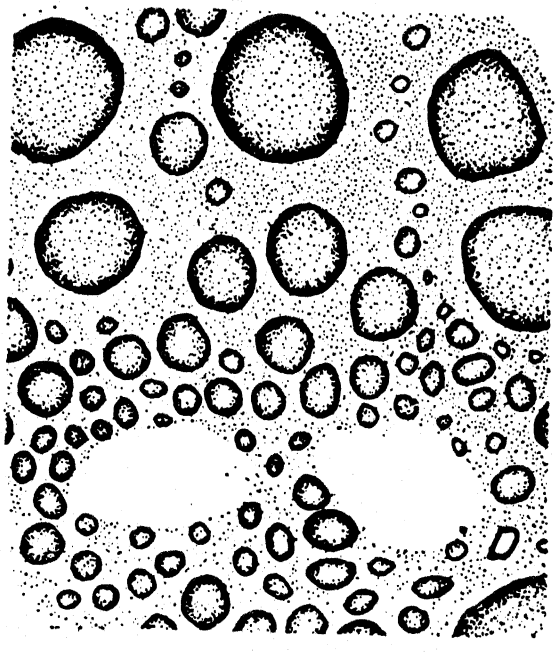

Figure 30.--Skin granulation (5,000X).

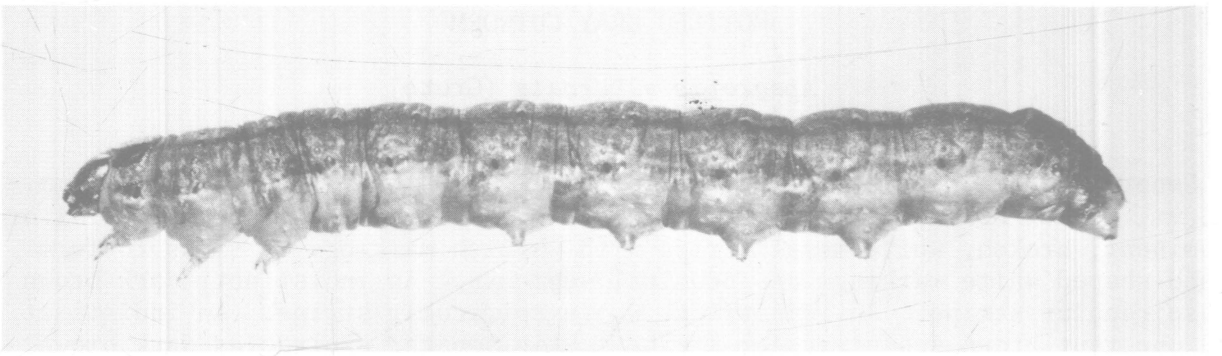

Figure 31.--Lateral view of black cutworm (3.7X).

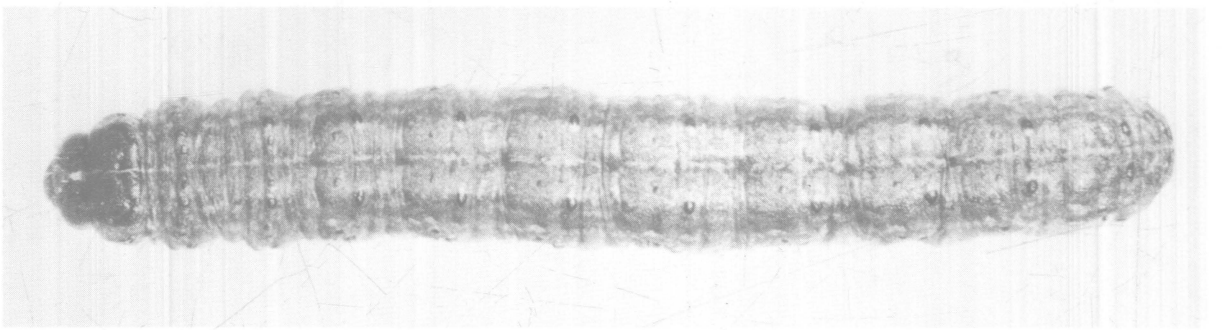

Figure 32.--Dorsal view of black cutworm (3.7X).

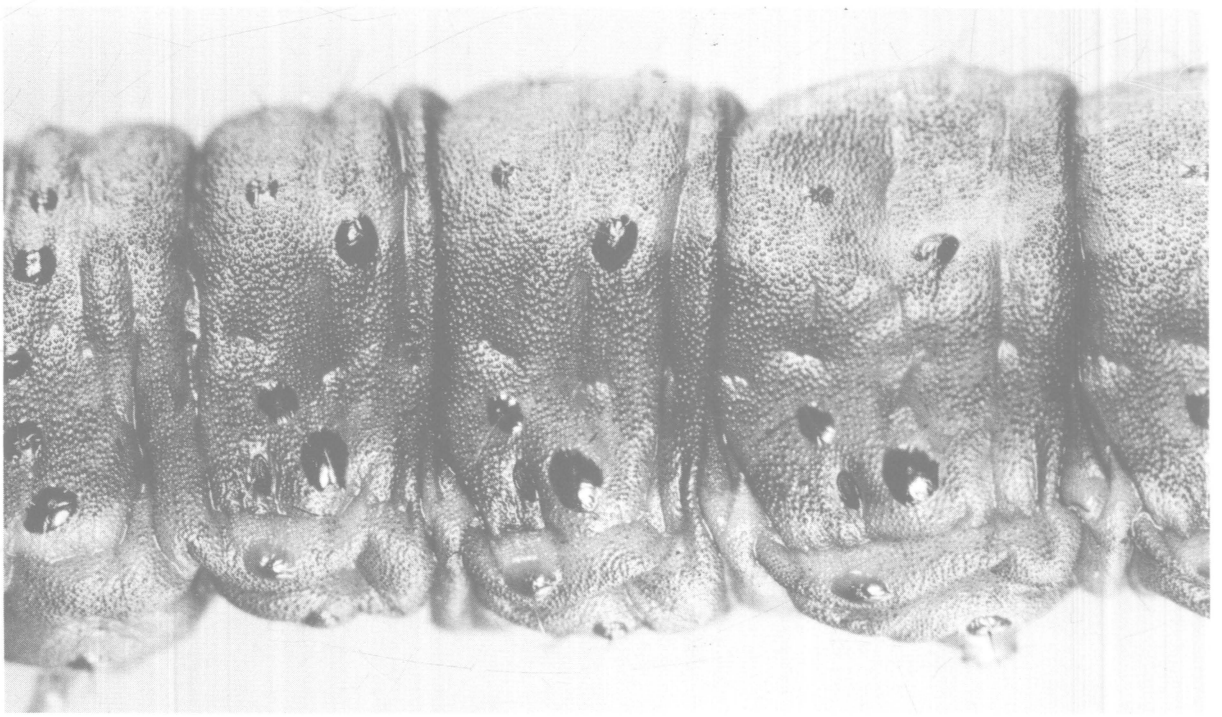

Figure 33.--Enlarged portion of first three abdominal segments showing highly pigmented tubercles and skin granulation. Lateral view (10X).

MOTTLED GRAY CUTWORM

Abagrotis alternata (Grote)

General color light brown with darker blotches on back. Body about 37 mm. long and 5 mm. wide. Head pale brown reticulated with dark brown; black submedial arcs. A prominent, broken, white mesal stripe with whitish markings on sides to form diamond-shaped white markings on abdominal segments. An indistinct, dark brown supraspiracular stripe. An indistinct, white spiracular stripe. An indistinct, wide, chestnut-brown subspiracular stripe. Skin smooth. Spiracles dark brown, rimmed with black.

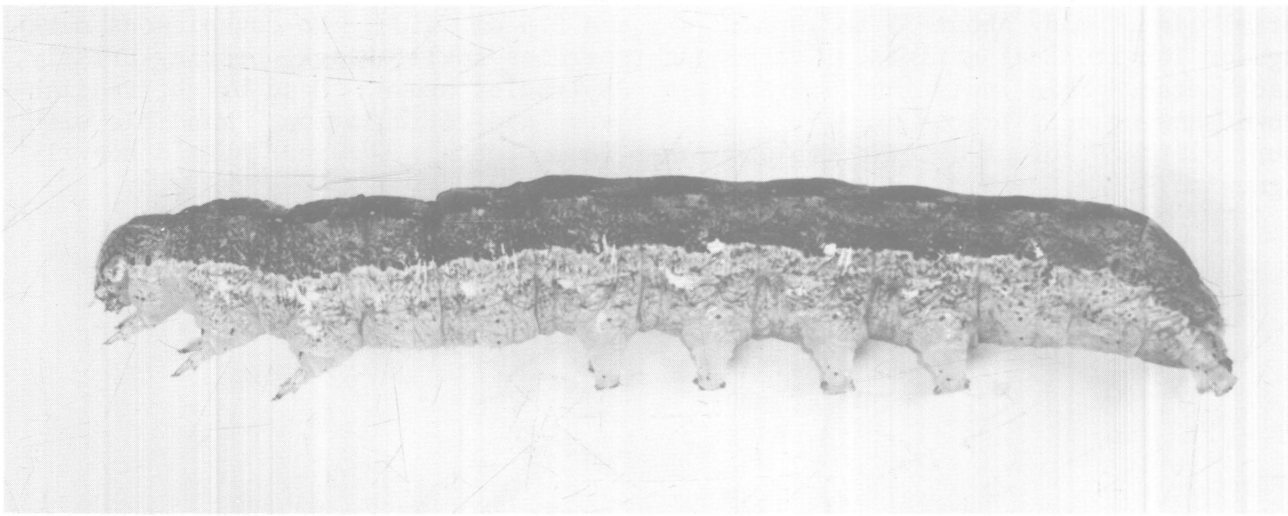

Figure 34.--Lateral view of mottled gray cutworm (4.3X).

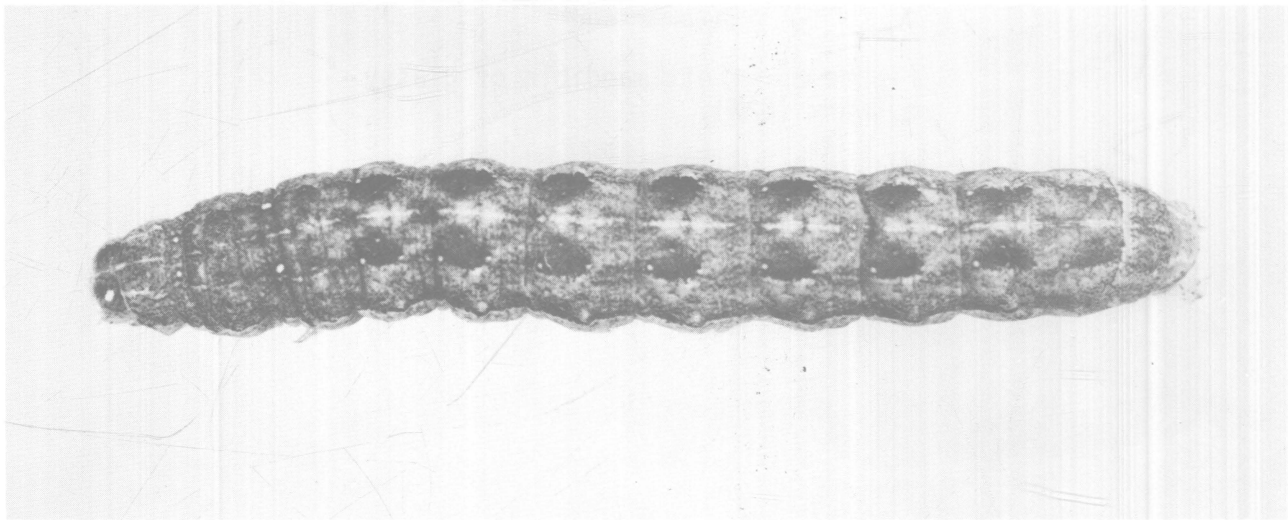

Figure 35.--Dorsal view of mottled gray cutworm (4.3X).

GLASSY CUTWORM

Crymodes devastator (Brace)

General color translucent, greenish-white with a faint, dark, subcutaneous mid-dorsal line. Body about 35 to 40 mm. long and 5.5 mm. wide. No conspicuous markings or longitudinal stripes. Setigerous tubercles small, black, bearing bristly, black setae. Skin indistinctly granulose. Spiracles brown. Head bright reddish-brown showing only traces of dark submedial arcs and reticulation. Mandible with four, distinct, blunt outer teeth and three inner teeth. Cervical shield heavily pigmented.

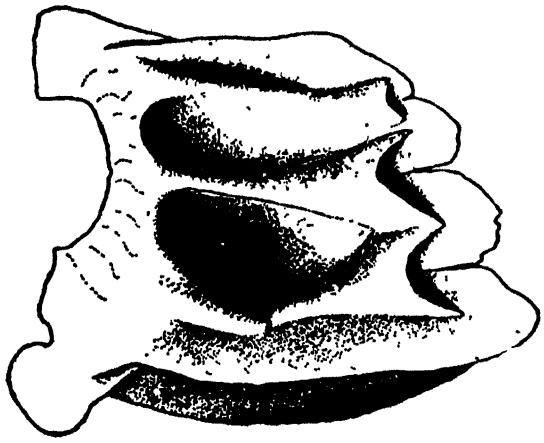

Figure 36.--Left mandible of glassy cutworm (62X).

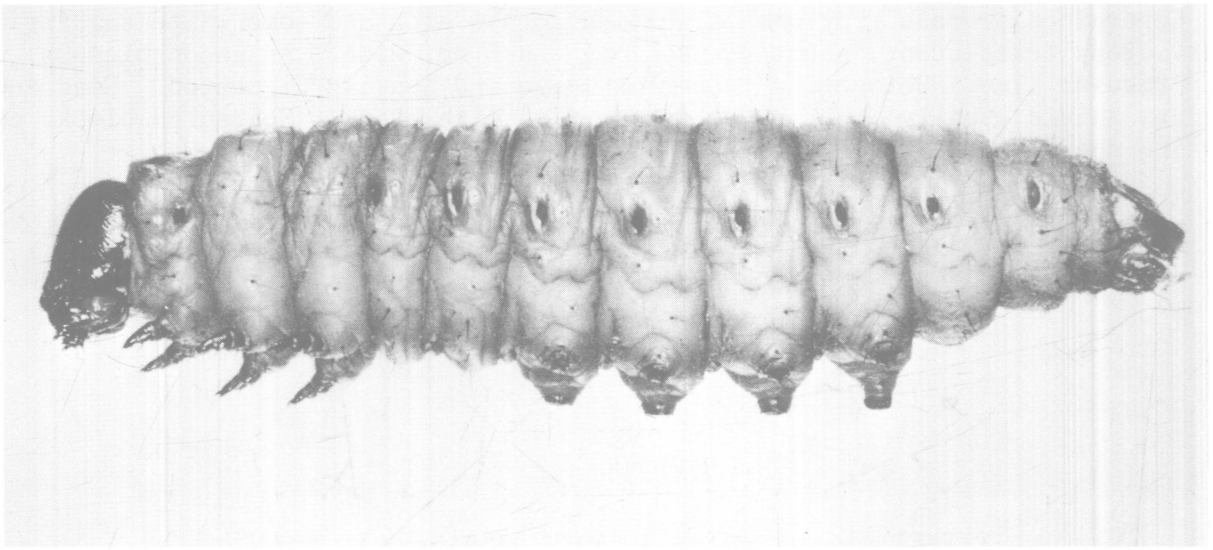

Figure 37.--Lateral view of glassy cutworm (3.7X).

Figure 38.--Dorsal view of glassy cutworm (3.7X).

WHITE CUTWORM

Euxoa scandens (Riley)

General color pale gray with a whitish dorsal area and some white shading on sides. Body translucent, about 45 mm. long and 5 mm. wide. An inconspicuous, white subspiracular line. Setigerous tubercles large and heavily pigmented. Head and cervical shield usually light brown and mottled with black. Spiracles black, contrasting sharply with the general ground color.

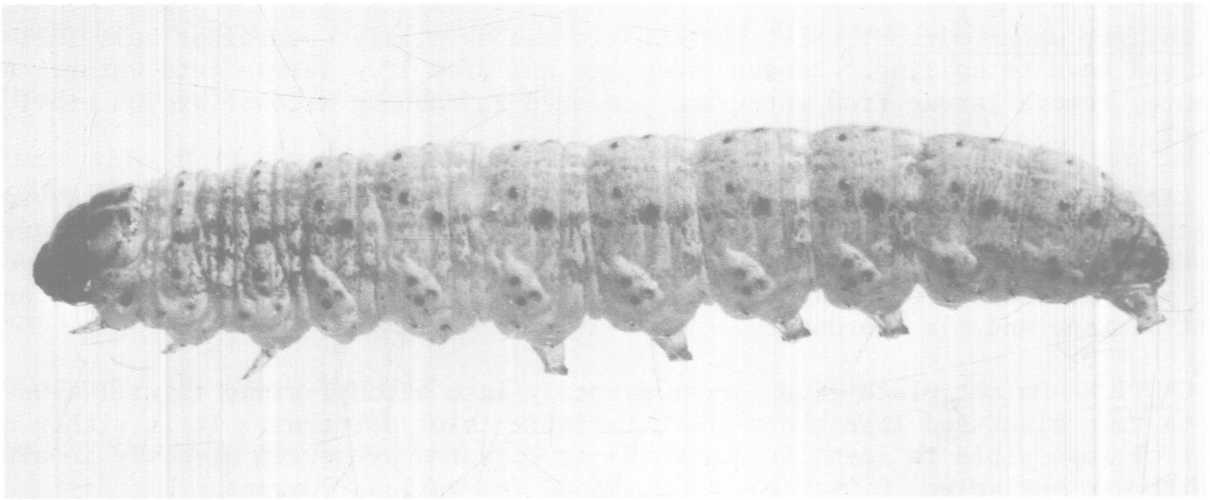

Figure 39.--Lateral view of white cutworm (3.7X).

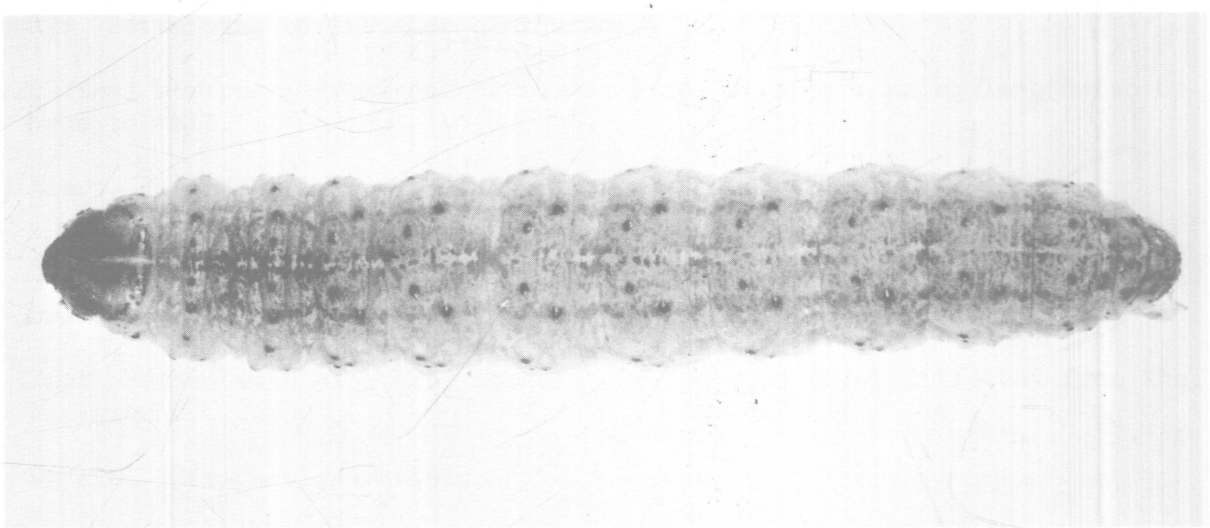

Figure 40.--Dorsal view of white cutworm (3.7X).

How to Preserve Armyworms and Cutworms

To preserve larvae for future study or to send them away for identification, follow one of the following procedures:

Boiling water method: Fill a clean tin can or similar container half full of water and heat to boiling. Remove from heat and drop live larvae into water. After 1 minute, remove larvae from water and preserve in rubbing alcohol or 70% ethyl alcohol.

KAAD method: Fill a screw-cap vial with KAAD and drop live larvae into vial. Replace cap, lay vial on side, and allow to set for 24 hours. Transfer the larvae from KAAD to rubbing alcohol or 70% ethyl alcohol. To prepare KAAD preservative, use 1 part kerosene, 10 parts 95% ethyl alcohol, 2 parts glacial acetic acid, and 1 part dioxane and mix thoroughly.

CAUTION--Do *not* place live larvae directly into alcohol since it will cause them to turn black and lose their characteristic color patterns. It is either difficult or impossible to identify armyworms or cutworms preserved directly in alcohol or which are shriveled, distorted, or darkened for various reasons.

Glossary

Adfontral sutures: The lines separating the adfrontal areas from the frontal areas (Fig. 7).

Anal shield: A dorsal, shield-like plate on top of the last abdominal segment.

Anterior: Forward or towards the head end.

Cervical shield: A heavily pigmented and sclerotized flat, oval plate just behind the top of the head.

Dorsal: Pertaining to top or back.

Dorsum: Top or back.

Equidistant: Of equal distance.

Flecked: Sprinkled with small patches of color.

Granules: Rough grains as opposed to a perfectly smooth surface.

Granulate: A surface roughened by the development of granules.

Instar: The caterpillar stages between molts or skin-casting.

Lateral: Pertaining to the side of the body.

Longitudinal stripes: Prominent narrow or broad stripes running lengthwise or from head to tail.

Mandibles: Paired biting jaws of insects.

Mesal: Pertaining to the center of the back.

Mid-dorsal stripe: A stripe running down the middle of the back.

Mottling: Marked with blotches, streaks, or spots of color different from the background.

Neck shield: See cervical shield.

Ocelli: Darkly pigmented, small, oval eye-spots on each side of the head.

Ovoid: Egg-shaped.

Posterior: Pertaining to the rear of the body.

Prolegs: Paired fleshy protruberances on the ventral aspect of the 3rd, 4th, 5th, 6th, and last abdominal segments.

Reticulation: A pattern of narrow lines resembling the threads of a net.

Rhomboidal: An area resembling a rectangle but with the corner angles greater or less than 90°.

Segmental series: A pattern or marking which is repeated on a series of thoracic or abdominal segments.

Setigerous tubercles: Small or conspicuous bumps bearing slender hairs or setae.

Sclerotized: Pertaining to hardened, brown or black structures such as the mandibles.

Sheen: A luster or shine produced by a reflection of light.

Skin texture: The smooth or granulate appearance of the surface of the skin on the sides and back of the thoracic and abdominal segments.

Spiracle: An oval, breathing pore on the sides of thoracic and abdominal segments of caterpillars.

Spiracular stripe: A longitudinal stripe which includes the spiracles.

Subconical: Nearly cone-shaped.

Subcutaneous: Just beneath the skin.

Submedial arcs: Heavily pigmented, crescent-shaped markings on the head (Fig. 7).

Subspiracular stripe: A longitudinal stripe just below the spiracles (Fig. 6).

Subventral: Area between lateral and ventral area.

Supraspiracular stripe: A longitudinal stripe just above the spiracles.

Teeth: Sharp-pointed structures on cutting or inner edge of the mandible.

Translucent: Partially transparent as frosted glass.

True legs: Sharp-pointed, tapering structures on ventral thoracic segments. Two per segment.

Tubercle: A small, rounded projection or bump.

Ventral: Pertaining to the underside or bottom.

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Figures 19, 26, and 30 were taken from Walkden's (1950) publication, while Figures 5, 12, 15, and 29 were modified from this same publication. Figure 6 was taken from Crumb's (1956) publication, while Figures 16, 20, and 36 were taken from Crumb's (1929) publication.

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